First midterm test – sample, 15^{th} March 2024

Name:

Points: /25

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1. Find the maximum of
$$f(x,y) = x^2 - 4x + y^2 - 2y + 8$$
on a rectangle
$$M = \{(x,y) \in \mathbb{R}^2,\ 1 \leq x \leq 3,\ 0 \leq y \leq 3\}$$

Points: /12

2. Find the maximum and the minimum of $f(x,y) = x^2 + 2y^2 - 4y$ subjected to the constraint
$$M = \{(x,y) \in \mathbb{R}^2,\ x^2 + y^2 = 9\}$$

Points: /8

3. Compute
$$\int \frac{5x^2}{x^2+1}\,\mathrm{d}x$$

Points: /5

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1. Find the maximum of
$$f(x,y) = x - y$$
on the set
$$M = \{(x,y) \in \mathbb{R}^2,\ x^2 + 2y^2 - 2xy \leq 25\}$$

Points: /12

2. Find the maximum of
$$f(x,y) = \frac{y}{x+2}$$
on a line segment bounded by points
$$A = (0,4),\ B = (2,0).$$

Points: /8

3. Compute
$$\int \frac{2^x + 3^{x+2}}{6^{-x}}\,\mathrm{d}x$$

Points: /5